

WHAT IS CLAIMED IS:

1.           A process device for use in a process control system, comprising:  
              output circuitry configured to couple to  
                                  the process control loop and control  
                                  electrical current through the loop to  
                                  transmit process-related information;  
              and  
              loop override circuitry configured to  
                                  override operation of the output  
                                  circuitry and set the electrical  
                                  current in the loop to a desired  
                                  current level.
2.           The apparatus of claim 1 including  
diagnostic circuitry configured to detect an alarm  
condition and responsively actuate the loop override  
circuitry.
3.           The apparatus of claim 2 wherein the  
diagnostic circuitry measures a quiescent current  
level.
4.           The apparatus of claim 2 wherein the diagnostic  
circuitry includes a sense resistor connected in  
series with the loop.

5. The apparatus of claim 2 wherein the diagnostic circuitry includes an analog to digital converter.

6. The apparatus of claim 2 wherein the diagnostic circuitry monitors trends in the current.

7. The apparatus of claim 2 wherein the diagnostic circuitry includes a microcontroller.

8. The apparatus of claim 1 wherein the process device is a process variable transmitter.

9. The apparatus of claim 1 wherein the process device is a process controller.

10. The apparatus of claim 1 wherein the process device is configured for use in a Safety Instrumented System.

11. The apparatus of claim 1 wherein the desired current level is more than 21 mA or less than 3.8 mA.

12. The apparatus of claim 1 wherein the loop override circuitry includes a microcontroller.

13. The apparatus of claim 1 wherein the process device is completely powered with power received through the process control loop.

14. The apparatus of claim 1 wherein the process control loop operates in accordance with the HART® protocol.

15. The apparatus of claim 1 including a comparator configured to actuate the loop override circuitry if the loop current is outside of a predetermined threshold level.

16. The apparatus of claim 1 wherein the loop override circuitry is connected in parallel with the output circuitry.

17. The apparatus of claim 1 wherein the loop override circuitry is connected in series with the output circuitry.

18. The apparatus of claim 1 wherein the loop override circuitry is configured to disconnect the output circuitry from the process control loop.

19. The apparatus of claim 1 wherein the loop override circuitry is configured to shunt current across the output circuitry.

20. The apparatus of claim 1 including a watch dog circuit configured to activate the loop override circuitry.

21. The apparatus of claim 1 including a microcontroller configured to activate the loop override circuitry.

22. The apparatus of claim 21 wherein the microcontroller activates the loop override circuitry based upon trends in the loop current.

23. The apparatus of claim 21 wherein the microcontroller actuates the loop override circuitry based upon a comparison of the loop current with an expected value of the loop current.

24. The apparatus of claim 1 including circuitry configured to disconnect circuitry within the process device.

25. The apparatus of claim 1 wherein the loop override circuitry is configured to disconnect the output circuitry and control the loop current level.

26. The apparatus of claim 25 wherein the loop current level is controlled by a redundant output circuit.

27. The apparatus of claim 1 wherein the process device is configured for use in a Safety Instrumented System (SIS).

28. The apparatus of claim 1 and further comprising a sensor configured to sense a process variable.

29. The apparatus of claim 28 wherein the process device is a process variable transmitter.

30. The apparatus of claim 1 wherein the output circuitry is configured to operate in accordance with one of the group of communication protocols consisting of Fieldbus, Profibus and HART®.

31. The apparatus of claim 1 wherein the output circuitry is configured to couple to a process control loop type selected from the group consisting of two-wire, three-wire and four-wire.

32. The apparatus of claim 1 wherein the loop override circuitry is further configured to electrically disconnect the process device from the process control loop.

33. A method implemented in a process device of sending a desired current signal on a process control loop, comprising:

detecting an alarm condition in a  
process device coupled to the  
process control loop;  
overriding operation of output circuitry  
in the device in response to  
a detected alarm condition, the  
output circuitry configured to  
control current in the process control  
loop; and  
controlling the loop current to a  
desired level during the step of  
overriding operation of the  
output circuitry.

34. The method of claim 33 wherein the alarm condition is related to quiescent current draw.

35. The method of claim 34 wherein detecting includes detecting trends in the quiescent current draw.

36. The method of claim 33 wherein the desired current level is more than 21 mA or less than 3.8 mA.

37. The method of claim 33 wherein the step of overriding is implemented in a microcontroller.

38. The method of claim 33 wherein the step of detecting is implemented in a microcontroller.

39. The method of claim 33 including completely powering the process device with power received through the process control loop.

40. The method of claim 33 wherein the process control loop operates in accordance with the HART® protocol.

41. The method of claim 33 wherein the step of detecting includes comparing a current to a predetermined threshold level.

42. The method of claim 33 wherein the step of overriding includes disconnecting output circuitry from the process control loop.

43. The method of claim 42 and further comprising controlling the loop current level with a redundant output circuit.

44. The method of claim 33 wherein the step of controlling includes shunting current across output circuitry.

45. The method of claim 33 wherein the step of detecting includes monitoring trends in the loop current.

46. The method of claim 33 wherein the step of detecting includes comparing the loop current with an expected value of the loop current.

47. A process device implementing the method of claim 33.

48. The method of claim 33 and further comprising sensing a process variable.

49. The method of claim 33 and further comprising communicating over the process control loop in accordance with a protocol selected from the group of protocols consisting of Fieldbus, Profibus, and HART®.

50. The method of claim 33 implemented in a device configured for use in a Safety Instrumented System.